

are in this case no longer true, but are approximately true only if the height be very small compared with the span. The correction to the curvature as calculated from the usual formula is found to be a constant.

The paper concludes with an account and a short discussion of the work of Lamé and Clapeyron, de Saint-Venant, Boussinesq, and, more recently, of M. Mathieu,* M. Ribière,† and Mr. J. H. Michell,‡ which bears upon the subject of rectangular beams. Although, in certain cases, some of the results overlap, the attempt has been made in the paper to co-ordinate them, and to present them in a more complete form, and to develop further the two-dimensional theory, so as to obtain solutions to various interesting questions relating to the effects of isolated loads.

“Antarctic Origin of the Tribe Schoenææ.” By C. B. CLARKE,
F.R.S. Received March 12,—Read April 24, 1902.

[PLATE 14.]

The map annexed to this paper is designed to illustrate the geographic distribution of all the species of the Schoenææ—a sub-or-do or tribus of the Cyperaceæ.

The result suggests a flow in geologic time of the sub-order from the South Pole up the three great southern prolongations of land, viz., Oceania, South Africa, Temperate South America; the number of species dying away rapidly as we recede from the South Pole.

I explain how the map is made. I take the outline map of the World divided into twenty-three geographic sub-areas, and my MSS. of the sub-order Schoenææ which show the distribution of every species with reference to these twenty-three sub-areas.

The first species is *Carpha alpina*, R. Br., which I see in the MS. has been collected in the sub-areas 12, 13, 14, 23. I put a spot of black paint in each of these four sub-areas, and proceed to the next species. I have treated 262 species in black dots, two in rings, two in crosses. The black dots do not signify anything as to the abundance of a species; nor in Australia and the Cape do they indicate more than that the species has been collected in that sub-area. But the outlying scattered spots in Central Africa, Japan, Jamaica, &c., are placed as accurately as the scale of the map would admit.

* ‘Théorie de l'Elasticité,’ Paris, 1890; also ‘Comptes Rendus,’ vol. 90, pp. 1272—74.

† ‘Sur Divers Cas de la Flexion des Prismes Rectangles,’ Bordeaux, 1889; also ‘Comptes Rendus,’ vol. 126, pp. 402—404 and 1190—92.

‡ ‘Quart. Journ. Math.,’ vol. 32.

All the material on which the map is founded has been seen and determined by me; no fact in the distribution is copied out of a list or depends on a name or a distribution number. The material recorded by number or name of collector in my MSS. is about 1850 collections. The great mass of the commoner species, or commoner habitats, is not recorded in my MSS., but is virtually included in the map.

The genera included in this sub-order are very close together, and may be arranged on a different system from mine; this would not affect at all the map, which deals only with species. I have doubtless made some errors in the specific determinations. Moreover, any competent man revising the material would have a different opinion from myself as regards some species and varieties. The utmost alterations that could thus be necessitated in the map would be two or three black dots more (or less) in Australia and the Cape.

The rings represent *Schœnus nigricans*, Linn., a cosmopolitan species, and *Schœnus ferrugineus*, Linn., a species closely allied to it but confined to the sub-area 1—"Cooler Europe." [It is so closely allied as to be sometimes confounded with it by learned cyperologists.]

In an exactly parallel manner, the crosses represent *Cladium Jamaicense*, Crantz, a cosmopolitan species, and *Cladium triglomeratum*, Nees, a United States plant so closely allied that some competent cyperologists call it a var. of *C. Jamaicense*.

Five of the genera occur in Oceania and South America; two occur in South Africa and South America; five occur in Oceania and the Cape; but the genera are so closely allied that little can be inferred from this. Only two or three species are common to Australia and South America.

Numerical tabulations on a large scale are viewed with suspicion by botanists, as they are often drawn in great part from books or from lists; the percentage of errors then introduced from wrong identifications, diversities in nomenclature, variable limits assigned to species and areas, and doubtfully wild species, is so large that it invalidates the conclusions. No one of these sources of error taints the present tabulation.

The conclusions suggested are—

- (1.) The sub-order Schœneæ originated in prehistoric time at some centre on which the three streams of species (Patagonian, Cape, Australian) converge, and has spread from that centre northward.
- (2.) Two of the genera, viz., *Schœnus* and *Cladium*, have developed largely, and produced each a great number of species.
- (3.) One species in each of these two genera has become cosmopolitan, a common case in large genera from one end of the Genera Plantarum to the other.

- (4.) Each of these two cosmopolitan species, superabundant in individuals, has thrown off a local offshoot, which in A.D. 1902 produces in our minds the impression of a geographic sub-species.

The whole preceding argument hangs on the question whether I have included the right genera in my sub-order Schœneæ. The Schœneæ dealt with in this map, are the 3-style-branched Schœneæ of Bentham, which are regarded as a very closely allied group by Kunth, Boeckeler, F. Mueller, and the orthodox cyperologists. In the Plant-families of Engler and Prantl a different system has been adopted; this, however, has not been accepted in their writings on Cyperaceæ either by Germans as Goebel, Solms-Laubach, Celakovski, or by Americans as Britton, Bailey. The present map is grounded on the systematic arrangement of Cyperaceæ by Bentham.

The few points in the map which I regard myself as doubtful I have given against my own case, *e.g.* :—

The outlying species marked in the North-west Himalaya is a small species—an elementary form—which I have placed in the Schœneæ, but may possibly really belong to some other sub-order.

Several outlying localities in West Africa and the West Indies, belong to one genus—*Remirea*—which was regarded by Bentham as an *abnormal* member of the Schœneæ.

There are several, and some large, orders of plants, as Proteaceæ, Restiaceæ, &c., confined, or nearly so, to the Southern Hemisphere; the present case is only one branch of a very large argument, presented in detail.

EXPLANATION OF MAP (PLATE 14).

The map represents the world-distribution of the 266 species which constitute the Schœneæ, with reference to the 23 sub-areas lined out in black. For each species a mark is put in each sub-area in which it occurs.

For 262 species the mark is a black dot.

For the two species *Schœnus nigricans*, Linn., *Schœnus ferrugineus*, Linn., the mark is a ring.

For the two species *Cladium Jamaicense*, Crantz, *Cladium triglomeratum*, Nees, the mark is a cross.

Clarke.













